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## AR2000 Super Recycler

Purdue ECT Team  
*Purdue University*, [ectinfo@ecn.purdue.edu](mailto:ectinfo@ecn.purdue.edu)

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## AR2000 SUPER RECYCLER

### THE NEED

Hot in-place recycling (HIR) is a process for rehabilitating deteriorated asphalt pavements. HIR recycling enables repaving to be 25-30% cheaper than traditional asphalt resurfacing systems and minimizes the disruption of traffic. Despite such benefits, the earlier generations of hot in-place asphalt recycling equipment has several shortcomings such as smoke and fumes, over-heated asphalt, fractured aggregate, difficulty in heating to sufficient depth and slow rate of production.



FIGURE 1 AR2000 IN ACTION

### THE TECHNOLOGY

Martec's AR2000 Super Recycler is a self-propelled equipment train, consisting of two identical Preheaters, a Heater-Miller and a Heater-Mixer as the main units totaling 210 feet (64 m) in length, with a conventional paver, a rubber-tired roller and a vibratory roller added to handle laydown and compaction. This train recycles asphalt pavement in five separate stages: preheating, hot milling, heat and stir, pugmill mixing, and laydown and compaction.

In the AR2000's unique heating system, which is used in all four main units, air is heated to about 1100oF in a diesel-fueled combustion chamber and blown directly onto the pavement through small holes in the large manifold. It is this high-velocity application of hot air, in combination with the low-level infrared heat generated by the manifold, that enables the AR2000 to gently and uniformly heat the pavement's surface layer to optimum temperatures for recycling. The spent hot air, which cools to about 650oF, is then vacuumed back into the combustion chamber for reheating and reuse, thereby minimizing heat loss. Age-hardening of the recycled asphalt binder is minimal and with



its virtually emission-free operation, Martec's AR2000 is setting new air-emission standards for the hot in-place recycling of asphalt pavements.

Following treatment by the two Preheaters which work in tandem, the milling heads of the Heater-Miller loosen and remove the softened pavement down to desired depths. In the Heater-Mixer, a series of devices is used to continuously mix and expose the loosened asphalt mixture to the combination of hot air and infrared heat, thereby ensuring that the recycled materials are thoroughly and uniformly heated. This also provides a final opportunity to remove excess moisture which in earlier HIR systems, was a limiting factor that commonly prevented recycled hot-mix asphalt from reaching temperatures above 212°F. By properly heating the newly exposed surface of the pavement's underlying layer, as well as the pavement edges, superior bonding of the recycled pavement is achieved with the creation of hot-welded joints during compaction.

Final mixing occurs after the heated recycled mix is picked up from a windrow on the pavement surface by a slat conveyor and transferred to a 300-tph pugmill located on the Heater-Mixer. Martec's asphalt recycling system permits the addition of new materials, such as recycling agents which can improve asphalt binder properties. New hot-mix asphalt or aggregate materials, both of which are used for structural correction and upgrading, can be added to the recycled material in sufficient volumes to provide a one-pass combined pavement thickness of up to 3 inches. Martec's AR2000 Super Recycler is easily capable of fully recycling to depths of 2 inches. When recycling at such depth, the work speed is 17 to 23 feet per minute and 1.75 miles of a single-lane roadway can typically be recycled in a working day. For mobilization to the next job site, the four main units can be connected to tractor trucks and towed at normal highway speeds.



Preheater No. 1



Heater-Miller



Heater - Mixer

**FIGURE 2 AR2000 SUPER RECYCLER EQUIPMENT TRAIN**



## THE BENEFITS

- **Savings in Cost and Time:** Martec's system for the hot in-place recycling of asphalt pavements offers potential savings of up to 30% in cost and 50% in time, compared to conventional resurfacing methods.
- **Environment-Friendly:** The AR2000 Super Recycler has been designed and manufactured to operate virtually emission free.
- **Operating Speed:** When recycling to depths of 50 millimeters, the work speed varies from 5 to 7 meters per minute, depending on road and weather conditions. Three kilometers of a single-lane roadway can typically be recycled in a working day.
- **Unique Heating System:** The Hot-Air / Infrared Heating System, with its combination of high-velocity hot air and low-level infrared heat, is capable of easily heating the surface layer of the asphalt pavement. This unique heating system also makes it possible to recycle polymer-modified asphalt.
- **Moisture Removal:** Moisture, which is normally present in deteriorated asphalt pavements, can reduce the production rate and quality of recycled asphalt. Martec's Hot-Air / Infrared Heating System, in combination with the Heat and Stir Process, is effective in removing excess moisture.
- **Addition of New Materials:** New hot-mix asphalt or aggregate materials can be added to the recycled asphalt in sufficient volumes to provide a one-pass combined pavement thickness of up to 75 millimeters.
- **Diesel-Fuel Capability:** For its heating process, the AR2000 Super Recycler uses diesel fuel which is readily available worldwide. This eliminates any need for liquefied gas, such as propane. Hot in-place asphalt recycling can now be safely performed anywhere in the world.
- **Fuel Efficiency:** The recirculating feature of Martec's Hot-Air / Infrared Heating System minimizes heat loss by vacuuming back, reheating and reusing the hot air used in the heating process.
- **Superior Bonding:** By properly heating pavement edges and the newly exposed surface of the pavement's underlying layer, hot-welded joints between old and new paving materials are created during compaction.
- **Easy Mobilization:** The four main units of the AR2000 Super Recycler can be easily connected to tractor trucks and towed at normal highway speeds between job sites.

## STATUS

Martec Recycling Corporation is now operating on hot in-place recycling (HIR) projects in the Ottawa-Carleton region of Ontario, Canada. The company is now focussing on the worldwide distribution of its unique hot in-place asphalt recycling system. Martec's mandate is to establish strategic relationships worldwide with qualified parties possessing solid experience in pavement maintenance and construction.



## **BARRIERS**

A greater emphasis on concrete pavements over asphalt pavement has impeded this technology from making a greater impact.

## **POINTS OF CONTACT**

**Jeffrey Steiner**, Martec Recycling Corp.

Tel: (416) 955-1600, Email: [jsteiner@gpex.com](mailto:jsteiner@gpex.com)

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## **REVIEWERS**

Peer reviewed as an emerging construction technology

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## **PUBLISHER**

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